

TRANSMITTAL LETTER TO THE UNITED STATES

KSN0023

DESIGNATED/ELECTED OFFICE (DO/EO/US)

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

CONCERNING A FILING UNDER 35 U.S.C. 371

10/069177

INTERNATIONAL APPLICATION NO

PCT/DE00/02704

INTERNATIONAL FILING DATE

10 August 2000

PRIORITY DATE CLAIMED

13 August 1999

TITLE OF INVENTION

ARRANGEMENT ENABLING A LIQUID TO FLOW EVENLY AROUND A SURFACE OF A SAMPLE AND USE OF SAID ARRANGEMENT

APPLICANT(S) FOR DO/EO/US

Daniel Hosten, Helge Schmidt and Michael Schwab

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☒ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☒ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

Return Postcard, Check No. **5563** in the amount of \$890.

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.492(a)(1)-(5)) 10/069177		INTERNATIONAL APPLICATION NO. PCT/DE00/02704		ATTORNEY'S DOCKET NUMBER KSN0023	
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24. The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :				CALCULATIONS PTO USE ONLY	
<input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1040.00					
<input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$890.00					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$740.00					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$710.00					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$890.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than months from the earliest claimed priority date (37 CFR 1.492 (e)). <input type="checkbox"/> 20 <input type="checkbox"/> 30				\$0.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	18 - 20 =	0	x \$18.00	\$0.00	
Independent claims	2 - 3 =	0	x \$84.00	\$0.00	
Multiple Dependent Claims (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL OF ABOVE CALCULATIONS =				\$890.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2.				\$0.00	
SUBTOTAL =				\$890.00	
Processing fee of \$130.00 for furnishing the English translation later than months from the earliest claimed priority date (37 CFR 1.492 (f)). <input type="checkbox"/> 20 <input type="checkbox"/> 30 +				\$0.00	
TOTAL NATIONAL FEE =				\$890.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL FEES ENCLOSED =				\$890.00	
				Amount to be:	\$
				refunded	
				charged	\$

a. ☒ A check in the amount of **\$890.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **02-0387** A duplicate copy of this sheet is enclosed.

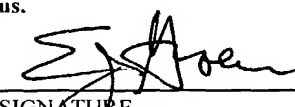
d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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32,230

 REGISTRATION NUMBER

February 13, 2002

 DATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Daniel Hosten, Helge Schmidt and Michael Schwab)
 Filed: PCT/DE00/02704 (August 10, 2000))
 Serial No.:)
 Title: ARRANGEMENT ENABLING LIQUID TO FLOW)
 EVENLY AROUND A SURFACE OF A SAMPLE)
 AND USE OF SAID ARRANGEMENT)
 Group/Art Unit:)
 Examiner:)
 Docket No.: KSN0023)

Honorable Commissioner for Patents
 Washington, D.C. 20231

Sir:

PRELIMINARY AMENDMENT

In the above-mentioned PCT application, please accept the enclosed application under the national stage pursuant to 35 USC § 371 and amend the application as follows:

In the Claims:

Please replace claims 1-11 of the application with claims 1-18 as follows:

1. An arrangement enabling a liquid to flow evenly around a surface of a sample, said arrangement comprising:

a flow chamber having said liquid flowing therethrough,

a sample located at least in part in said flow chamber and rotatable about an axis of rotation by means of a rotary drive,

inflow and outflow pipes each extending to opposite ends of the flow chamber from inflow and outflow containers, respectively,

an inflow tube terminating in the inflow container,

an outflow tube beginning in the outflow container,

a flow generator, and

filters arranged in the inflow and/or outflow container or in the inflow and outflow pipes, respectively, and having the liquid flowing therethrough,

wherein the inflow and outflow pipes extend in opposite ends of the flow chamber and the outflow tube begins in the outflow container.

2. An arrangement according to claim 1, wherein the size and the number of the filter pores is set to be varying across the overall filter area such that a pressure differential between the inflow/outflow pipes arranged at different distances from the inflow/outflow tube, which causes non-uniform flow through said pipes, is compensated by different overall pore areas associated with the individual pipes.

3. An arrangement according to claim 1, for electro-depositing or electro-removing material on or from the surface of the sample, comprising an electrode in the flow chamber, wherein the liquid is an electrolyte and wherein the sample and the electrode are connected to a pulsating or constant current source.

4. An arrangement according to claim 3, for electro-depositing or electro-removing material on or from the surface of the sample, wherein

the flow chamber has two planar confining walls arranged parallel to the direction of flow and having a first and a second recess, respectively,

the sample has a substantially planar surface having said axis of rotation arranged perpendicularly thereto,

the sample covers the first recess and said planar surface defines a plane with the associated confining wall, and

the electrode covers the second recess with a planar surface and defines a plane with the associated confining wall.

5. An arrangement according to claim 4, wherein the electrode has a grid basket of electrochemically inert material that is filled with the material to be deposited in granular form and has a planar surface containing holes.

6. An arrangement according to claim 4, wherein the electrode consists of a metal body having a planar surface and coated with platinum or another noble metal.
7. An arrangement according to claim 1, wherein the inflow and/or outflow tube extends via a throttle valve into a supply container filled with liquid, said supply container having means for filtering as well as for regulating the temperature, the pH value, the filling level and optionally also the ion concentration of the liquid.
8. The use of the arrangement according to claim 5, for depositing a layer of a nickel/iron alloy on a silicon or ceramic wafer, the alloy composition and the intrinsic mechanical stress of the layer being homogeneous across the wafer.
9. The use of the arrangement according to claim 5, for applying electrophoretic photoresist to a wafer.
10. The use of the arrangement according to claim 1, for electroless deposition of material on the surface of the sample.
11. The use of the arrangement according to claim 1, for removing material from the surface of the sample, with the liquid used being an etching solution.
12. An arrangement enabling a liquid to flow evenly around a surface of a sample, said arrangement comprising a flow chamber profiled for allowing liquid to flow therethrough, a rotary drive mechanism having a sample mounting surface profiled relative to said flow chamber whereby a sample can be located at least in part in said flow chamber and rotatable about an axis of rotation by said rotary drive mechanism, an inflow manifold and an out flow manifold positioned on opposite ends of said flow chamber, each manifold having flow tubes extending from said respective manifold and into said flow chamber, said manifolds and said flow tubes defining a laminar flow pattern through said flow chamber.
13. The arrangement of claim 12, further comprising filters arranged in the inflow and/or outflow container or in the inflow and outflow pipes, respectively, and having the liquid flowing therethrough.
14. An arrangement according to claim 12, wherein the size and the number of the filter pores is set to be varying across the overall filter area such that a pressure differential between the inflow/outflow pipes arranged at different distances from the inflow/outflow tube, which causes non-uniform flow through said pipes, is compensated by different overall pore areas associated with the individual pipes.

15. An arrangement according to claim 12 for electro-depositing or electro-removing material on or from the surface of the sample, comprising an electrode in the flow chamber, wherein the liquid is an electrolyte and wherein the sample and the electrode are connected to a pulsating or constant current source.

16. An arrangement according to claim 12 for electro-depositing or electro-removing material on or from the surface of the sample, wherein

- the flow chamber has two planar confining walls arranged parallel to the direction of flow and having a first and a second recess, respectively,
- the sample has a substantially planar surface having said axis of rotation arranged perpendicularly thereto,
- the sample covers the first recess and said planar surface defines a plane with the associated confining wall, and
- the electrode covers the second recess with a planar surface and defines a plane with the associated confining wall.

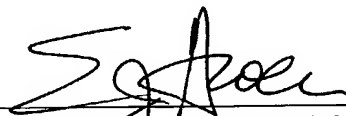
17. An arrangement according to claim 12, wherein the electrode has a grid basket of electrochemically inert material that is filled with the material to be deposited in granular form and has a planar surface containing holes.

18. An arrangement according to claim 12, wherein the electrode consists of a metal body having a planar surface and coated with platinum or another noble metal.

REMARKS

Applicant respectfully requests that the above preliminary amendment be entered, and that the fees due herewith are calculated using the new claims, not the claims of the PCT application.

Respectfully submitted,



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(PCT/DE00/02704)

5 Description**Arrangement Enabling a Liquid to Flow Evenly Around a Surface of a Sample and Use of Said Arrangement**

10 The invention relates to an arrangement enabling a liquid to flow evenly around a surface of a sample, with the sample rotating in said liquid. In addition thereto, the invention relates to the use of said arrangement.

15 Such arrangements are employed in particular for electro-processing surfaces, in which a sample connected to the cathode as well as an anode are arranged opposite each other in an electrolyte. It is desirable in electrodeposition in this regard that the deposited layers
20 be homogeneous across the coated surface with respect to layer thickness and other functional properties, such as intrinsic stress. This necessitates a uniform transfer of the substance dissolved in the electrolyte to the layer surface.

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The document EP 0 856 598 A1 discloses an apparatus for electroplating a surface, in which a rotating sample is laterally subjected to the flow of the electrolyte through a nozzle. Due to the rotating sample, a homogeneous layer thickness may be obtained by averaging.
30 The disadvantage of this arrangement consists in that the flow discharged from the nozzle is not laminar. The thus caused formation of eddies results in non-uniform deposition rates. Furthermore, the non-uniform flow also affects the anode on which the material to be deposited
35 dissolves in the electrolyte. With non-uniform flow to

the anode, there may occur ion concentration differences within the electrolyte.

Furthermore, there are arrangements known for electro-
40 deposition of layers in which a sample at rest is arranged in a flow cell. With the flow cell, the flowing in and flowing out liquid is passed through a plurality of small tubes arranged in parallel. This arrangement thus attempts to create an as uniform as possible flow
45 in the cell. The disadvantage of this arrangement consists in that particles present on the sample at rest may cause flow shadows. In addition thereto, partially occurring inhomogeneities in the electric field between anode and cathode are not compensated due to the sample
50 at rest.

It is thus an object of the present invention to make available an arrangement enabling a uniform flow of a liquid around a surface of a sample in which flow eddies
55 or turbulences, flow shadows and inhomogeneities due to a sample at rest are avoided and in which the flow across the surface is of laminar nature.

According to the invention, this object is met by an arrangement according to claim 1. Advantageous developments of the invention as well as uses of the invention are indicated in the further claims.

The invention indicates an arrangement enabling a liquid
65 to flow evenly around a surface of a sample, comprising a flow chamber through which said liquid flows. In said flow chamber, a sample is provided at least in part and can be rotated about an axis of rotation by means of a rotary drive. Starting from an inflow container and an
70 outflow container, inflow pipes and outflow pipes, respectively, extend from and to opposite ends of the flow chamber. The pipes start from the respective containers.

The liquid is supplied to the inflow container via an inflow tube. The liquid is discharged from the outflow container via an outflow tube beginning in the latter.
75 The inflow and outflow containers just have a manifold function from the tubes to the pipes. The arrangement furthermore has means suitable for generating a flow. In addition thereto, the arrangement has filters through
80 which said liquid flows at a location of said arrangement. These filters are arranged either in the inflow and outflow containers, respectively, or in the inflow and outflow pipes, respectively.

85 Due to the combination of a flow cell and a filter having the liquid flowing therethrough, according to the invention, and due to the homogeneous flow in the inflow and outflow pipes resulting therefrom, a laminar flow around the surface is obtained together with a rotating
90 sample. The effect achieved furthermore is that inhomogeneities occurring due to a stationary sample are avoided.

A particularly homogeneous flow around the surface is
95 obtained according to the invention in that the pores of the filter or filters are set such that, with respect to the size and number thereof, that the pressure differential between the inflow and outflow pipes, which have different distances from the inflow or outflow tube, is
100 compensated. This is achieved preferably in that, in case of pipes further away from the inflow or outflow tube, a larger overall pore area of the associated filter or filter portion has liquid flowing therethrough as compared to pipes arranged close to the inflow or out-
105 flow tube.

The arrangement according to the invention may be used in particularly advantageous manner for electro-depositing or electro-removing material on or from the surface

110 of a sample if the flow chamber has an electrode arranged therein and the liquid is an electrolyte. The sample and the electrode are connected to a current source. It is possible to employ a dc current source the polarity of which is chosen in correspondence with the
115 application for depositing or removing. The current source moreover may also be of pulsating nature, thereby permitting also the deposition of mechanically twisted layers on the sample surface.

120 Particularly advantageous is an arrangement for electrodepositing or electro-removing material on or from a surface of a sample, in which according to the invention the flow chamber has two mutually parallel planar confining walls. The confining walls have a first and a
125 second recess, respectively. The sample has a substantially planar surface and is arranged to be rotatable about an axis of rotation perpendicular to said surface, such that this surface covers the first recess, with the surface defining a plane together with the associated
130 confining wall. The electrode has a planar surface as well, covering the second surface and defining a plane with the associated confining wall. The flow chamber in this case is confined by planar confining walls extending parallel to the inflow and outflow pipes, which further encourages the formation of a laminar flow.
135

Particularly advantageous is an arrangement for electrodepositing material, in which according to the invention the anode is a grid basket of electrochemically inert
140 material, which has a planar surface containing holes. This grid basket is filled with the material to be deposited, which is in granular form. Due to the granular form of the material to be deposited, the area of contact with the electrolyte is especially large, whereby
145 the material to be deposited dissolves more easily in the electrolyte.

In addition thereto, it is especially advantageous if the electrode consists of a metal coated with platinum or another noble metal. In this case, material to be deposited will be re-furnished solely by substitution of the spent electrolyte. The electrolyte or the usually aqueous solvent thereof will then be decomposed at the anode. A possible electrochemical reaction with an electrolyte containing dissolved nickel would be, for example, the deposition of nickel on the cathode and the simultaneous generation of oxygen from the water of the solution at the anode.

Especially advantageous is an arrangement enabling a liquid to flow evenly around a surface of a sample, in which according to the invention the inflow and outflow tubes each extend via a throttle valve into a supply container filled with liquid. Suitable means for generating a flow in this regard is a liquid pump pumping the liquid of the supply container through the inflow tube. Furthermore, the supply container contains means for filtering and for regulating the temperature, the pH value and the filling level of the liquid. In the event that the liquid is an electrolyte, there are provided moreover means for regulating the ion concentration of the electrolyte.

It is thus rendered possible, for example, to control a coating process with very high accuracy, since monitoring and control of the relevant parameters of temperature, pH value and ion concentration of the electrolyte are favorable for homogeneous layer deposition.

The invention may be employed in particularly advantageous manner for depositing a mechanically twisted layer of a nickel/iron alloy on a wafer. This wafer then consists preferably of silicon or ceramics. The effect

achievable by use of the arrangement according to the
185 invention is that the composition of the alloy and the
intrinsic mechanical stress of the layer is homogeneous
across the wafer. By patterning rectangles that are sub-
sequently etched back in part, springs bent away from
the wafer may be produced from the deposited layer in a
190 batch process. Such springs are utilized, for example,
in miniaturized relays.

The arrangement according to the invention may also be
utilized in particularly advantageous manner for apply-
195 ing electrophoretic varnish or resist to wafers. The
voltage required for electrophoresis is applied between
the wafer and an opposing electrode.

Furthermore, the arrangement according to the invention
200 may also be used very advantageously for electroless or
autocatalytic deposition of material on the surface of
the sample.

In addition thereto, the arrangement according to the
205 invention may also be used for removing material from
the surface of the sample with the aid of an etching so-
lution. For example, the surface of a silicon wafer
could be etched with KOH solution.

210 In the following, the invention will be elucidated in
more detail by way of embodiments and the associated
drawing figures.

Fig. 1 illustrates a schematic longitudinal sectional
215 view of an arrangement according to the invention ena-
bling a liquid to flow around a surface.

Fig. 2 illustrates a schematic transverse sectional view
of a flow chamber of an arrangement enabling a liquid to

220 flow evenly around a surface, according to the inven-
tion.

Fig. 3 illustrates a schematic longitudinal sectional
view of a supply container having an inflow tube and an
225 outflow tube introduced therein.

Fig. 1 illustrates an arrangement enabling a uniform
flow around a surface, comprising a flow chamber 1 hav-
ing an electrolyte 2 provided therein. A wafer 3 is ar-
230 ranged on the upper side of the flow chamber 1. The wa-
fer 3 is connected to a cathode 4 and rotatable about an
axis perpendicular to its surface by means of a rotary
drive 5. The rotary drive 5 is supported by means of
bearing 22 and sealed with respect to the wafer with the
235 aid of gasket 23. Arranged opposite the wafer 3 is a
grid basket 15 connected to an anode 6 and containing
the material to be deposited in the form of granulate
14. Flow chamber 1 is surrounded by a casing 18. Ar-
ranged laterally on each side of said flow chamber 1 are
240 an inflow container 9 and an outflow container 10, re-
spectively. Containers 9, 10 are connected to flow cham-
ber 1 via inflow pipes 7 and outflow pipes 8, respec-
tively. The inflow container 9 and the outflow container
10 each have a filter 13 arranged therein. This filter
245 13 provides for as uniform flow as possible through in-
flow pipes 7 and outflow pipes 8. The filter 13 has fil-
ter pores 24 allowing the electrolyte 2 to flow there-
through.

250 Fig. 2 shows a flow chamber 1 covered on the upper side
by a wafer 3. Laterally of flow chamber 1, there are ar-
ranged an inflow container 9 and an outflow container
10. The inflow container 9 has an inflow tube 11 termi-
nating therein which transports liquid into inflow con-
255 tainer 9. The outflow container 10 has an outflow tube
12 beginning therein which transports liquid away from

outflow container 10. The flow chamber 1 is connected to inflow container 9 and outflow container 10 via parallel extending inflow pipes 7 and outflow pipes 8, respectively. Inflow container 9 and outflow container 10 have a filter 13 with filter pores 24 arranged therein. The size of the filter pores 24 is selected to vary across the overall filter area such that the pressure differential between inflow pipes 7 and outflow pipes arranged at different distances from the inflow tube 11 and the outflow tube 12, respectively, is compensated. This provides for uniform flow through the inflow pipes 7 and the outflow pipes 8, which favors a laminar flow in flow chamber 1.

Fig. 3 illustrates a supply container 17 filled with electrolyte 2 and having an outflow tube 12 and an inflow tube 11 extending thereinto. Inflow tube 11 is passed into supply container 17 via a throttle valve 16. Conveying pump 20 is used as means for generating a flow. Arranged in supply container 17 is a heater 19 used for regulating the temperature. By means of an additional conveying pump 25 and a filter cartridge 21, the electrolyte 2 from supply container 17 can be cleaned in a continuous process.

With the aid of the rotary drive and the conveying pump, the rotational speed of the wafer and the flow rate of the electrolyte can be matched to the desired process.

The invention is not restricted to the embodiments illustrated in exemplary form, but is defined in its most general form by claim 1.

290 **Claims**

1. An arrangement enabling a liquid (2) to flow evenly around a surface of a sample (3), said arrangement comprising
 - 295 - a flow chamber (1) having said liquid (2) flowing therethrough,
 - a sample (3) located at least in part in said flow chamber (1) and rotatable about an axis of rotation by means of a rotary drive (5),
 - 300 - inflow and outflow pipes (7, 8) each extending to opposite ends of the flow chamber (1) from inflow and outflow containers (9, 10), respectively,
 - an inflow tube (11) terminating in inflow container (9),
 - 305 - an outflow tube (12) beginning in outflow container (10),
 - means (20) for generating a flow, and
 - filters (13) arranged in the inflow and/or outflow container (9, 10) or in the inflow and outflow pipes (7, 8), respectively, and having the liquid
 - 310 (2) flowing therethrough.
2. An arrangement according to claim 1, wherein the size and the number of the filter pores
315 (24) is set to be varying across the overall filter area such that a pressure differential between inflow/outflow pipes (7, 8) arranged at different distances from inflow/outflow tube (11, 12), which causes non-uniform flow through said pipes (7, 8), is
320 compensated by different overall pore areas associated with the individual pipes (7, 8).
3. An arrangement according to claim 1 or 2 for electro-depositing or electro-removing material on or from
325 the surface of the sample (3), comprising an elec-

trode (6) in the flow chamber (1), wherein the liquid (2) is an electrolyte and wherein the sample (3) and the electrode (6) are connected to a pulsating or constant current source.

330

4. An arrangement according to claim 3 for electro-depositing or electro-removing material on or from the surface of the sample, wherein

335

- the flow chamber (1) has two planar confining walls arranged parallel to the direction of flow and having a first and a second recess, respectively,

340

- the sample (3) has a substantially planar surface having said axis of rotation arranged perpendicularly thereto,

- the sample (3) covers the first recess and said planar surface defines a plane with the associated confining wall, and

345

- the electrode (6) covers the second recess with a planar surface and defines a plane with the associated confining wall.

5. An arrangement according to claim 4, wherein the electrode (6) has a grid basket (15) of electrochemically inert material that is filled with the material (14) to be deposited in granular form and has a planar surface containing holes.

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6. An arrangement according to claim 4, wherein the electrode (6) consists of a metal body having a planar surface and coated with platinum or another noble metal.

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7. An arrangement according to claims 1 to 6, wherein the inflow and/or outflow tube (11, 12) extends via a throttle valve (16) into a supply con-

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11/12

365 tainer (17) filled with liquid (2), said supply container (17) having means for filtering (21) as well as for regulating the temperature (19), the pH value, the filling level and optionally also the ion concentration of the liquid (2).

370 8. The use of the arrangement according to claims 5 to 7 for depositing a layer of a nickel/iron alloy on a silicon or ceramic wafer (3), the alloy composition and the intrinsic mechanical stress of the layer being homogeneous across the wafer (3).

375 9. The use of the arrangement according to claims 1 to 7 for applying electrophoretic photoresist to a wafer (3).

380 10. The use of the arrangement according to claim 1 or 2 for electroless deposition of material on the surface of the sample.

385 11. The use of the arrangement according to claim 1 or 2 for removing material from the surface of the sample, with the liquid used being an etching solution.

Abstract

390 The invention relates to an arrangement enabling a liquid (2) to flow evenly around a surface of a sample (3); said arrangement has a flow chamber (1) through which a liquid (2) flows via inflow and outflow pipes (7, 8). The sample (3) can be rotated about an axis of rotation
395 by means of a rotary drive (5). A filter (13) which extends crosswise to the direction of flow of the liquid (2) and which ensures a uniform flow through the inflow and outflow pipes (7, 8) is situated in front of the inflow and outflow pipes (7, 8). The arrangement is
400 especially suitable for depositing a homogeneous layer of a nickel/iron alloy on a silicon wafer (3). The invention relates furthermore to the use of the arrangement.

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FIG 1

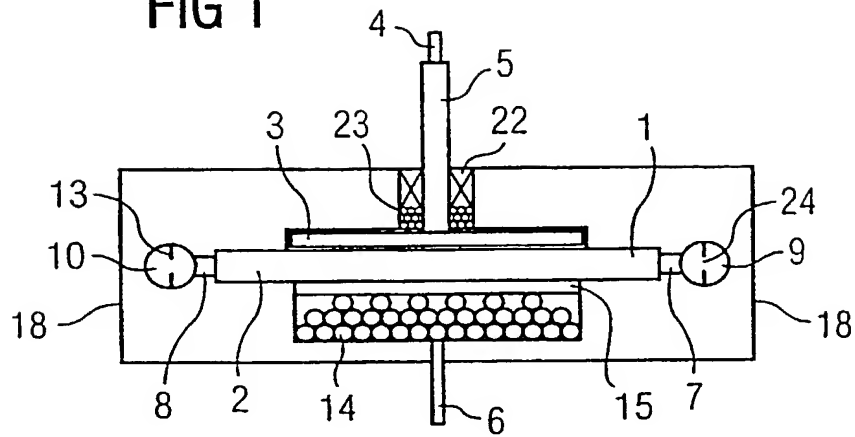


FIG 2

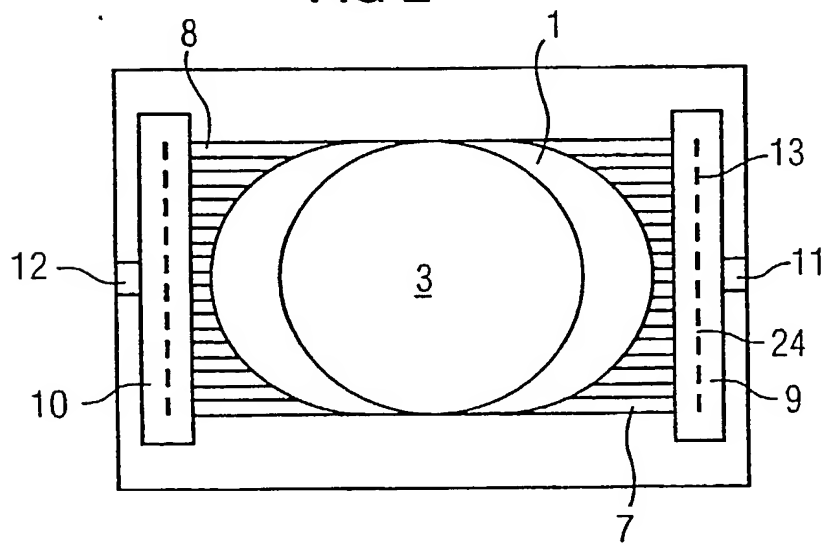
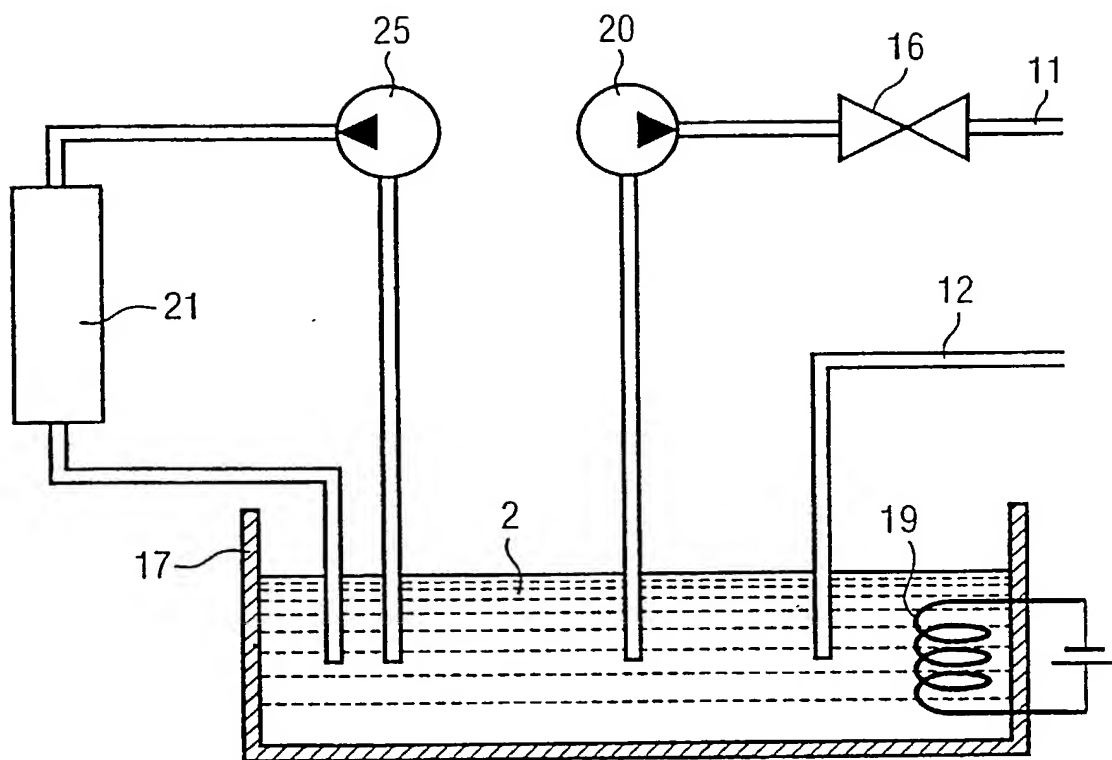
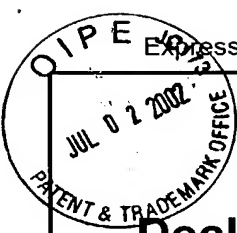


FIG 3





Express Mail Label No.

Docket No.
KSN0023

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

ARRANGEMENT ENABLING LIQUID TO FLOW EVENLY AROUND A SURFACE OF A SAMPLE AND USE OF SAID ARRANGEMENT

the specification of which

(check one)

- ☐ is attached hereto.
- ☒ was filed on February 13, 2002 as United States Application No. or PCT International Application Number 10/069,177 and was amended on February 13, 2002 (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority Not Claimed
<u>DE 19938409.6</u>	<u>Germany</u>	<u>13 August 1999</u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	
<u></u>	<u></u>	<u></u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	
<u></u>	<u></u>	<u></u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)	(Filing Date)
(Application Serial No.)	(Filing Date)
(Application Serial No.)	(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

PCT/DE00/02704	10 August 2000	Pending
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)


I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

Eric J. Groen, 32,230
 Gerard T. Gallagher, 39,679
 Daniel Tychonievich, 41,358
 Kevin R. Erdman, 33,687
 Michael S. Gzybowski, 32,816
 John F. Hoffman, 26,280
 Anthony Niewyk, 24,871
 Nancy G. Tinsley, 37,098
 Arthur R. Whale, 18,778

Send Correspondence to: **Eric J. Groen**
Baker & Daniels
 205 West Jefferson Blvd., Suite 250
 South Bend, IN 46601

Direct Telephone Calls to: *(name and telephone number)*
 Eric J. Groen (574)234-4149

Full name of sole or first inventor Daniel Hosten	
Sole or first inventor's signature 	Date 05.06.2002
Residence Staatsbaan 147, B-8610 Handzam, BE x	
Citizenship Belgium	
Post Office Address Staatsbaan 147, B-8610 Handzam, BE	

Full name of second inventor, if any Helge Schmidt	
Second inventor's signature	Date
Residence Am Woogbach 33, 67346 Speyer, DE	
Citizenship German	
Post Office Address Am Woogbach 33, 67346 Speyer, DE	

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Post Office Address Staatsbaan 147, B-8610 Handzam, BE	

Full name of second inventor, if any Helge Schmidt	
Second inventor's signature	Date
Residence Am Woogbach 33, 67346 Speyer, DE	
Citizenship German	
Post Office Address Am Woogbach 33, 67346 Speyer, DE	

Full name of third inventor, if any Michael Schwab	
Third inventor's signature <i>Michael Schwab</i>	Date 02-06-05
Residence Lohmeyerstrasse 24, 10587 Berlin, DE	Spiegelbergstrasse 6, 88677 Markdorf, DE.
Citizenship German	
Post Office Address Lohmeyerstrasse 24, 10587 Berlin, DE	Spiegelbergstrasse 6, 88677 Markdorf, DE

Full name of fourth inventor, if any	
Fourth inventor's signature	Date
Residence	
Citizenship	
Post Office Address	

Full name of fifth inventor, if any	
Fifth inventor's signature	Date
Residence	
Citizenship	
Post Office Address	

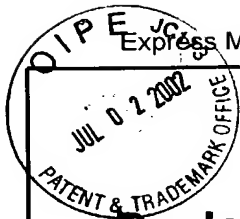
Full name of sixth inventor, if any	
Sixth inventor's signature	Date
Residence	
Citizenship	
Post Office Address	

Full name of third inventor, if any Michael Schwab	
Third inventor's signature	Date
Residence Lohmeyerstrasse 24, 10587 Berlin, DE Spiegelbergstrasse 6, 88677 Markdorf, DE	
Citizenship German	
Post Office Address Lohmeyerstrasse 24, 10587 Berlin, DE Spiegelbergstrasse 6, 88677 Markdorf, DE	

Full name of fourth inventor, if any	
Fourth inventor's signature	Date
Residence	
Citizenship	
Post Office Address	

Full name of fifth inventor, if any	
Fifth inventor's signature	Date
Residence	
Citizenship	
Post Office Address	

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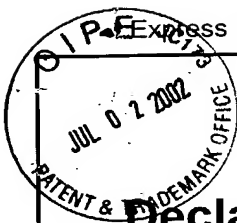
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Residence	
Citizenship	
Post Office Address	

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PCT/DE00/02704 (Application Serial No.)	10 August 2000 (Filing Date)	Pending (Status) (patented, pending, abandoned)
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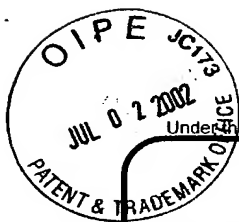
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Eric J. Groen (574)234-4149

Full name of sole or first inventor Daniel Hosten	
Sole or first inventor's signature	Date
Residence Staatsbaan 147, B-8610 Handzam, BE	
Citizenship Belgium	
Post Office Address Staatsbaan 147, B-8610 Handzam, BE	

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Second inventor's signature	Date
Residence Am Woogbach 33, 67346 Speyer, DE	
Citizenship German	
Post Office Address Am Woogbach 33, 67346 Speyer, DE	



PTO/SB/122 (10-01)

Approved for use through 10/31/2002. OMB 0651-0035

U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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#5

CHANGE OF CORRESPONDENCE ADDRESS Application

Address to:
Assistant Commissioner for Patents
Washington, D.C. 20231

Application Number	10/069,177
Filing Date	February 13, 2002
First Named Inventor	Daniel Hosten
Art Unit	
Examiner Name	
Attorney Docket Number	KSN0023

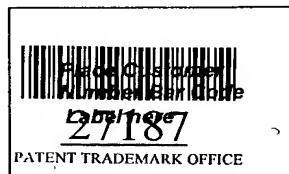
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Individual Name

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This form cannot be used to change the data associated with a Customer Number. To change the data associated with an existing Customer Number use "Request for Customer Number Data Change" (PTO/SB/124).

I am the :



Applicant/Inventor.



Assignee of record of the entire interest.

Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).



Attorney or Agent of record.



Registered practitioner named in the application transmittal letter in an application without an executed oath or declaration. See 37 CFR 1.33(a)(1). Registration Number

Typed or Printed
Name

Daniel Tychonievich, Reg. No. 41,358

Signature

Daniel Tychonievich

Date

June 25, 2002

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.



*Total of 1 forms are submitted.

Burden Hour Statement This form is estimated to take 3 minutes to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.